

Through interaction with digital technologies for work, play, and communication, our pattern for intellectual development is being altered. The multiple intelligences theoretical framework developed by Gardner (1983) is easily employed to provide evidence that yet another intelligence, digital intelligence, has emerged. In our postmodern pluralistic global culture, the multiple intelligences theory has enjoyed success and has impacted teaching practice. By acknowledging the existence of a new digital intelligence and all of the implications this acknowledgement may create for education and communication, we increase our ability to develop effective strategies to accommodate this new intellectual style.

Gardner (1999) encountered evidence that did not easily fit in his original model of multiple intelligences and he supposes more intelligence categories to accommodate his observations. Gardner submitted two additional distinct intelligences: moral intelligence and spiritual intelligence. He also pondered that besides these two new vessels for containment even more information has emerged that surrounds the intellectual virtuosos he described as "symbol analysts" and "masters of change." Could these observed but unclassified characteristics be the indication of an emerging intelligence that is being fostered by human interaction with digital technologies?

Knowledge, Ways of Knowing, and Intelligence

Information is a fluid that often takes on no form until a pattern is discovered that appears to take into consideration that many possibilities for assemblage exist, but settles on the most accommodating. As with most strong models and theories, the multiple intelligences theory has defined rules for organization of information that will accommodate new evidence in such a way that will further extend the organization and therefore substantiate existing understanding and work to create new knowledge. To facilitate a discussion of intelligence, one must posses an understanding of the relationship

between knowledge, modes of knowing, and intelligence. While each has a distinct definition, all exist in an interactive relationship.

Knowledge

Knowledge can very broadly be defined as what we know or believe to exist. Many conceptions of the organization of knowledge exist. "The task of demarcating kinds of knowledge is not unlike that of demarcating different territories on a map. As there are different kinds of maps of territory, so there are different kinds of maps of knowledge" (Schrag, 1992, p. 268). Machlup (1980), in the first volume of his proposed eight volume set entitled *Knowledge: Its Creation, Distribution, and Economic Significance*, created a classification for the types of knowledge by grouping what we are able to know into discrete categories such as mundane knowledge, scientific knowledge, humanistic knowledge, social-science knowledge, and artistic knowledge. A discussion of the many knowledge classification systems is beyond the scope of this article. Machlup's classification is mentioned to illustrate one conception of knowledge as "what we know."

Ways of Knowing

The modes of knowing or ways of knowing endeavor to describe the human process of internalizing knowledge. Eisner (1985), in his preface to *Learning and Teaching the Ways of Knowing*, described his editing assumptions:

Since contexts change, the capacities of mind themselves alter. The roads to knowledge are many. Knowledge is not defined by any single system of thought, but is diverse. What people know is expressed in the cultural resources present in all cultures. (p. 3)

Included as topics in this collection of modes of knowing are aesthetic, scientific, interpersonal, narrative, formal, practical, and spiritual ways of knowing.

The question of what knowledge is most worthy of knowing and by which mode of

knowing this knowledge is to be internalized is often cultural but is ultimately a personal decision. Knowledge and the ways of knowing work together to create intelligence.

Intelligence

Intelligence, as defined by Gardner (1993), is “the ability to solve problems, or fashion products, that are valued in one or more cultural or community settings” (p. 7). More simply put, it is the ability of individuals to use knowledge in a personal way to successfully interact with their environment. Gardner’s definition of intelligence differs somewhat from the widely held notion that intelligence is a direct measure of knowledge. Intelligence becomes a measure of enculturation, combining knowledge and the ways of knowing with the ability to interact effectively in a cultural or community setting.

Multiple Intelligences Theory

In his original multiple intelligences classification system, Gardner (1993) defined the criteria for distinction of intelligence classes. He stated, “Each intelligence must have an identifiable core operation or set of operations. As a neurally based computational system, each intelligence is activated or ‘triggered’ by certain kinds of internally or externally presented information” (p. 16). An additional criterion was described that “an intelligence must also be susceptible to encoding in a symbol system—a culturally contrived systems of meaning, which captures and conveys important forms of information” (p. 16). Gardner contended that intelligence takes on seven domains or modes of operation. He likened intelligence to talent and outlined the following seven domains in which talent or intelligence functions: musical, bodily-kinesthetic, verbal-linguistic, interpersonal, intrapersonal, spatial, and logical-mathematical. Gardner contended that these seven intelligences reflect the way the nervous system has evolved over the millennia to yield certain discrete kinds of intelligence. He claimed that it is irrelevant whether intelligence is either inborn or learned.

Digital Intelligence — The Argument for an Additional Intelligence

No one contends that any of the original seven intelligences or the two new intelligences used for Gardner’s (1983) theoretical framework

are invalid; it is merely observed that yet another intelligence has emerged. A different intelligence, resulting from human interaction with digital computers, exists.

Classification systems are constructed around the developer’s beliefs of what knowledge is worthy of transmission. Gardner (1983) may not have held digital knowledge in the same esteem as other knowledge structures when creating his framework. As with all strong models, he did allow for the development of other intelligences. In the epilogue of *Multiple Intelligences: Theory in Practice*, Gardner (1993) foresaw “the mental landscape [of the future] might be reconfigured in light of accumulated knowledge. I have every reason to believe that the map would be drawn in a somewhat different way” (p. 250). Possibly the future is not as distant as the year 2013 that Gardner chose for prediction. In 1965, it was estimated that knowledge doubled every five years. By the year 2003, it is predicted that knowledge will double every two months. Gardner may have figured time on the 1965 scale.

Gardner’s (1993) own definition of intelligence as “the ability to solve problems or fashion products that are of consequence in a particular cultural setting or community” (p. 15) sets criteria allowing for the emergence of a digital intelligence. Our society is increasingly becoming McLuhan’s (1964) “global village.” Digital technologies have truly become an extension of man and the external neural network McLuhan described is under construction. This new intelligence is a response to the cultural change brought about by digital technologies and takes into account the skills and talents possessed by the “symbol analysts” and “masters of change” recently recognized in Gardner’s (1999) latest book. Through the development and infusion of digital technology, communication methods are rapidly expanding and taking on new forms. These technological advancements have allowed fluency across all cultures and at the same time have rapidly increased our ability for information gathering, storage, and retrieval. A new intelligence has begun to emerge—one that allows us to effectively fashion products that are of consequence in this new cultural and community setting.

Artists often describe their ability to create art as if the information or knowledge about their particular art exists in a multidimensional state in their environment. Their talent lies in their ability to decode this information and transfer it into a medium that others can more easily appreciate. This is the artists' own description of the talent or intelligence that Gardner (1983) termed musical intelligence. We have developed this type of phenomenon with information of all descriptions. We have moved it into multidimensional digital space. Information is no longer arranged in linear fashion but is now object oriented and often clustered. Because of the new functions provided through digital technologies, information/knowledge may be personally arranged and rearranged. It could be said that those with the ability to understand and interact with this digital information to arrange, manipulate, and display it according to their perceptions possess yet another intelligence—an intelligence made up of components of the other intelligences, just as musical or spatial intelligence is described by Gardner to exist. As Gardner (1999) described, there exist individual virtuosos with the characteristics of symbol analyst and master of change. Those possessing this talent could be termed digitally intelligent.

Continuing with Gardner's (1993) criteria of universality and symbol encoding system to define the existence of a discrete intelligence, there is little question of the universality of digital media across cultures. The development of computer icons used for communication within a digital environment satisfies the criterion of encoding in a symbol system. When using Gardner's own criterion for intelligence classification, digital intelligence logically exists.

Postman (1992) wrote of "the surrender of culture to technology." Slouka (1995) told with caustic humor of his initiation into cyberspace: "What I discovered, obscured by the 'noise' of the Internet, was arguably the biggest subculture in recorded history, a virtual electronic nation" (p. 43). Papert (1993) described how computers changed the fabric of my own work. What struck me most forcibly [about computers] was that certain problems

that had been abstract and hard to grasp became concrete and transparent, and certain projects that had seemed interesting but too complex to undertake became manageable. (p. 13)

These references are being made about the ability to fashion products in the form of information/communication that are of consequence in a digital culture or community.

Current literature has found a link between the multiple intelligences theory and technology. Articles outlining the uses of technology to address multimodal learning are increasing in popularity. These articles often describe the flexibility of digital technologies and prescribe specific uses of digital media to facilitate development of each of Gardner's (1993) seven currently described intelligences. Gardner described how learning to program a computer might involve multiple intelligences:

Logical-mathematical intelligence seems central, because programming depends upon the deployment of strict procedures to solve a problem or attain a goal in a finite number of steps. Linguistic intelligence is also relevant, at least as long as manual and computer languages make use of ordinary language...an individual with a strong musical bent might best be introduced to programming by attempting to program a simple musical piece (or master a program that composes). An individual with strong spatial abilities might be initiated through some form of computer graphics—and might be aided in the task of programming through the use of a flowchart or some other spatial diagram. Personal intelligences can play important roles. The extensive planning of steps and goals carried out by the individual engaged in programming relies on intrapersonal forms of thinking, even as the cooperation needed for carrying a complex task or for learning new computational skills may rely on an individual's ability to work with a team. Kinesthetic intelligence may play a role in working

with the computer itself, by facilitating skill at the terminal. (p. 390)

Gardner's description of the interaction of all of the seven intelligences with technology could lead one to conclude that digital intelligence has evolved as a meta-intelligence—one that is composed of many of the constituent intelligences.

A change in world culture caused by digital technology is occurring. Changes in communication style, life style, economic practice, and the way we think have been caused by digital technology. Our "ability to solve problems or fashion products that are of consequence in a particular cultural setting or community" (Gardner, 1993, p. 15) is directly related to our ability to interact with this emerging digital environment.

Turkle (1995) wrote:

The computer offers us both new model of mind and a new medium on which to project our ideas and fantasies...a nascent culture of simulation is affecting our ideas about mind, body, self and machine. (pp. 9-10)

The lessons of computing today have little to do with calculation and rules; instead they concern simulation, navigation, and interaction....The computer culture's center of gravity has shifted decisively to people who do not think of themselves as programmers. (p. 19)

We are moving from a modernist culture of calculation toward a postmodernist culture of simulation.... Mainstream computer researchers no longer aspire to program intelligence into computers but expect intelligence to emerge from the interactions of small subprograms. If these emergent simulations are "opaque," this is not necessarily a problem...our brains are opaque to us, but this has never prevented them from functioning perfectly well as minds. (pp. 19-20)

Healy (1990) contended changing lifestyles may be altering children's brains in

subtle but critical ways and spoke of the development of a new intellectual style. When discussing digital technology, she wrote that "subtle shifts in what the human brain is required to do will eventually cause it to modify itself for new uses" (p. 332). Her concern with this topic caused her to inquire of Dr. Jerome Bruner his opinion of changing brains in a technological age. His reply:

The only thing I can say with some degree of certainty is that the evolution of human brain function has changed principally in response to the linkage between human beings and different tool systems. It would seem as if technology and its development leads to a new basis of selection...surely there must be a variety of changes in progress that resulted from writing systems, even though writing systems were introduced only a short time ago as far as we reckon on evolutionary time. And now, of course, we have computers and video systems, and how long before the selection pattern changes as a result of these? (Healy, 1990, p. 334)

McLuhan (1964) told us "the medium is the message/message" (p. 2), meaning our intelligences are shaped by the communication media we employ. Negroponte (1995) believed that our digital acumen has evolved to a point where "the medium is not the message in a digital world. It is an embodiment of it. A message might have several embodiments automatically derivable from the same data" (p. 71). He contended that our accessibility to knowledge in the form of information is becoming seemingly limitless, and with this accessibility comes the ability for us to interpret that knowledge in whichever way our intelligences need it to be interpreted.

A digital intelligence is emerging. It has rooted itself in our conceptions of knowledge and has become integrated into our ways of knowing. Intellectual skills have begun to depend upon our ability to interact in a digital environment. It is true that technology is a tool, but these digital tools have changed world culture. "An artifact pushed far enough tends to

reincorporate the user" (McLuhan & Powers, 1989, p. 3). Considerable uncertainty surrounds the impact that possession of this emerging digital intelligence will have on the future structure of our society. Such things as individual self-concept, teaching and learning practices, and organizational authority are but a few of the areas that have begun to feel the impact. The recognition and incorporation of this new intel-

ligence as a category in the multiple intelligences theory would serve to widen the inquiry into responsive teaching and learning.

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